

What is claimed is:

1. A method of identifying a fingerprint using minutiae points of the fingerprint, the method comprising:

(a) enrolling a fingerprint of a first user in a first database by extracting  $n$  minutiae points from a fingerprint image of the first user; selecting one of the  $n$  minutiae points as a reference point; rotating the other minutiae points by a predetermined angle with respect to the reference point; generating a first user table containing information regarding the first user's fingerprint based on geometrical changes of the other minutiae points which are obtained by the rotation; and storing the first user table in the first database; and

(b) identifying a fingerprint of a second user by extracting  $m$  minutiae points from a fingerprint image of the second user; selecting one of the  $m$  minutiae points as a reference point; generating a second user table containing information regarding the second user's fingerprint based on geometric changes of the other minutiae points obtained by rotating the other minutiae points by an angle about the reference point; comparing the second user table with the first user table, and selecting a similar candidate list of user tables,

wherein  $m$  and  $n$  are integers.

2. The method of claim 1, wherein the first and second user tables specify types of the minutiae points, and geometric changes in locations and angles of the other minutiae points with respect to location and angle of the selected minutiae point.

3. The method of claim 1, wherein (a) comprises:

(a1) selecting a first reference plane using one of the minutiae points as an origin;

(a2) generating the first user table by obtaining minutiae point information specifying locations, directions, and types of the other minutiae points in the first reference plane; and

(a3) performing (a1) and (a2) on each of the remaining minutiae points.

4. The method of claim 1, wherein (a) further comprises:

(a4) selecting two of the minutiae points and selecting a second reference

plane with an origin centered between the selected two minutiae points, and a reference axis along a line connecting the selected two points;

(a5) obtaining minutiae point information specifying locations, directions, and types of the remaining minutiae points from the second reference plane, and creating the first user table based on the obtained minutiae point information; and

(a6) performing (a4) and (a5) on each of the remaining minutiae points.

5. The method of claim 4, wherein (a4) further comprises selecting two of the minutiae points and selecting the second reference plane using a distance between the selected two minutiae points as a unit distance.

6. The method of claim 3 or 4, wherein the minutiae point information is obtained by measuring the locations and directions of the other minutiae points with respect to the origin of the first or second reference plane and quantizing a result of measurement at predetermined intervals.

7. The method of claim 1, wherein (b) comprises:

(b1) selecting a third reference plane using one of the minutiae points as an origin;

(b2) obtaining minutiae point information specifying locations, directions, and types of the remaining minutiae points in the third reference plane and generating the second user table based on the obtained minutiae point information; and

(b3) performing (b1) and (b2) on each of the remaining minutiae points.

8. The method of claim 1, wherein (b) further comprises:

(b4) selecting two of the minutiae points and selecting a fourth reference plane with an origin centered between the selected two minutiae points, and a reference axis along a line connecting the selected two points;

(b5) obtaining minutiae point information specifying locations, directions, and types of the remaining minutiae points from the fourth reference plane and creating the second user table based on the obtained minutiae point information; and

(b6) performing (b4) and (b5) on each of the remaining minutiae points.

9. The method of claim 8, wherein (b4) further comprises selecting two of the minutiae points and selecting the fourth reference plane using a distance between the selected two minutiae points as a unit distance.

10. The method of claim 7 or 8, wherein the minutiae point information is obtained by measuring the locations and directions of the other minutiae points with respect to the origin of the third or fourth reference plane and quantizing a result of measurement at predetermined intervals.

11. The method of claim 1, wherein (b) comprises:

(b1) forming at least one circle each with a different radii, centered at the origin of one of the third and fourth reference planes, setting locational and angular ranges of allowable errors, applying weights to each of the at least one circle, and applying the locational ranges of allowable errors to the respective minutiae points; and

(b2) applying the angular ranges of allowable errors to the respective minutiae points while applying weights to the minutiae points according to a quantization size.

12. The method of claim 1, wherein (b) further comprises:

(b3) distributing a predetermined number of the first user tables stored in the first database corresponding to a predetermined number of users and storing the distributed first user tables in at least one distributed storage medium.

(b4) comparing the information regarding the second user's fingerprint with the distributed first user tables stored in the storage medium to determine similarities between the information regarding the second user's fingerprint with the first user tables and selecting a predetermined number of candidates based on the similarities; and

(b5) selecting a predetermined number of candidates from the candidates selected in (b4) in order of similarity .

13. An apparatus for identifying a fingerprint using minutiae points of the fingerprint, comprising:

a first information extracting unit which receives information regarding a first

user's fingerprint that is to be enrolled in a database, extracts  $n$  minutiae points from the first user's fingerprint, sets one of the  $n$  minutiae points as a reference point, creates a first user table based on geometric characterizations of the other minutiae points, and outputs the first user table;

5           a second information extracting unit which receives information regarding a second user's fingerprint that is to be identified, extracts  $m$  minutiae points from the second user's fingerprint, sets one of the  $m$  minutiae points as a reference point, creates a second user table based on geometric characterizations of the other minutiae points, and outputs the second user table;

10           the database which stores the first user table; and

          a matching unit which compares the first user table with the second user table to determine similarities therebetween and determines whether the second user's fingerprint can be identified based on the similarities,  
          wherein  $m$  and  $n$  are integers.

15           14. The apparatus of claim 13, wherein the matching unit comprises at least one buffer unit in which the first user table is stored when driving the apparatus, the buffer distributing the information regarding the first user's fingerprint into predetermined parts and individually stores the distributed information.

20           15. The apparatus of claim 13, wherein one of the first and second information extracting units selects a first reference plane using one of the minutiae points as an origin, obtains minutiae point information specifying locations, directions, and types of the other minutiae points in the first reference plane, and creates the  
25           first or second user table based on the minutiae point information.

          16. The apparatus of claim 13, wherein the first or second information extracting unit selects two of the minutiae points; selects a second reference plane with an origin centered between the selected two minutiae points, and a reference  
30           axis along a line connecting the selected two minutiae points; obtains minutiae point information specifying locations, directions, and types of the other minutiae points in the second reference plane; and creates the first or second user table based on the minutiae point information,

          wherein the distance between the two selected points is used as an actual

distance or as a unit distance.

17. The apparatus of claim 15 or 16, wherein the minutiae point information is obtained by measuring the locations and directions of the other minutiae points with respect to the origin of the first or second reference plane and quantizing a result of measurement at predetermined intervals.

18. The apparatus of claim 14, wherein the matching unit forms at least one circle, each with a different radii, centered at the origins of one of the first and second reference plane, sets locational and angular ranges of allowable errors and applying weights to each of the at least one circle, applies the locational ranges of allowable errors to the respective minutiae points, applies the angular ranges of allowable errors to the minutiae points while applying weights to the minutiae points according to a quantization size, and determines similarities between the minutiae points based on the result of applying the location and angular ranges to the respective minutiae points.

19. A computer readable recording medium on which a program that executes a method of identifying a fingerprint is recorded in a computer, wherein the method comprises:

(a) enrolling a fingerprint of a first user in a first database by extracting  $n$  minutiae points from a fingerprint image of the first user; selecting one of the  $n$  minutiae points as a reference point; rotating the other minutiae points by a predetermined angle with respect to the reference point; generating a first user table containing information regarding the first user's fingerprint based on geometrical changes of the other minutiae points which are obtained by the rotation; and storing the first user table in the first database; and

(b) identifying a fingerprint of a second user by extracting  $m$  minutiae points from a fingerprint image of the second user; selecting one of the  $m$  minutiae points as a reference point; generating a second user table containing information regarding the second user's fingerprint based on geometric changes of the other minutiae points obtained by rotating the other minutiae points by an angle about the reference point; comparing the second user table with the first user table, and selecting a similar candidate list of user tables,

wherein  $m$  and  $n$  are integers.